DOCUMENT-IDENTIFIER: US 6120661 A
TITLE: Apparatus for processing glass substrate

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BSPR:
When the conventional supporting stage having the electrostatic chuck constituted of a dielectric member is heated up to a high temperature, the dielectric member undergoes cracking due to a linear thermal expansion coefficient difference between the supporting stage and the dielectric member, and the electrostatic chuck does not function as such any longer. For example, JP-A-10-32239 discloses means for overcoming the above problem, or discloses a supporting stage having an electrostatic chuck which is manufactured by junctioning a ceramic sintered plate for the electrostatic chuck and a ceramic/aluminum composite plate. The ceramic sintered plate for the electrostatic chuck and the composite plate are junctioned to each other by soldering or brazing. When the above supporting stage is used, plasma etching with excellent temperature control at a high temperature can be carried out. However, when a glass substrate having a large area of 0.6 m.times.0.7 m, or a glass substrate having a large area of 1 m.times.1 m to be used in the future, is processed, it is very difficult to manufacture a large-area composite plate composed of ceramic and aluminum.

BSPR:
In a plasma etching method using etching gas, a deposit of an etching product is excessively formed on a chamber side wall and a ceiling plate of a chamber of an etching apparatus, and as a result, the deposit may

become a particle
source to impair the etching of a base material. That is, the following
problem may occur. The etching product is deposited on the chamber side wall
and the ceiling plate before it reaches a discharge portion of the etching
apparatus. When etching procedures are repeated, therefore, the etching
product deposited on the chamber side wall and the ceiling plate peels off to
be a particle source, and as a result, the particle level is downgraded.

BSPR:
For example, when plasma etching is carried out on a base material, preferably,
part of the glass substrate processing apparatus of the present invention
constitutes a parallel-flat-plate upper opposing electrode, and the upper
opposing electrode comprises the composite material formed of the matrix in
which the aluminum-containing material is filled in the texture of the ceramic
member and the ceramic layer formed on the surface of the matrix by a thermal
spraying method. In this case, preferably, the upper opposing electrode is
provided with temperature control means, and further, the temperature control
means is preferably a heater. For example, the upper opposing electrode can be
heated up to a temperature at which a precursor incident on the surface of the
upper opposing electrode can be eliminated from the upper opposing electrode.
The heater may be disposed outside the composite material, or it may be
disposed within the matrix. In the latter case, when the matrix has a linear
thermal expansion coefficient .alpha..sub.1 [unit: 10.sup.-6 /K], preferably, a
linear thermal expansion coefficient .alpha..sub.H [unit: 10.sup.-6 /K] of a
material constituting the heater satisfies (.alpha..sub.1 -4).ltoreq..alpha..sub.H .ltoreq.(.alpha..sub.1 +4). When

the linear thermal
expansion coefficient .alpha..sub.1 of the matrix and the linear thermal
expansion coefficient .alpha..sub.H of the material constituting the heater
satisfy the above relationship, the occurrence of damage on the ceramic layer
can be effectively prevented. Since the ceramic layer is formed on the surface
of the matrix by a thermal spraying method, the upper opposing electrode can be
easily produced even if the glass substrate processing apparatus has large
dimensions. In some cases, a ceramic layer having the form of a plate may be
attached to the surface of the matrix by a brazing method.

BSPR:
The treatment on the base material includes etching treatment including plasma
etching, CVD treatment including plasma CVD treatment and sputtering treatment
including soft etching treatment of the base material.

DRPR:
FIG. 9 is a conceptual view of an ICP type plasma etching apparatus.

DEPR:
In the glass substrate supporting stage 10 shown in FIG. 1A, generally,
temperatures are controlled mainly by heating with the heater 15 although
temperature control is not always so depending upon the predetermined
temperature of the glass substrate 40. The temperature control of the glass
substrate supporting stage 10 with the temperature-controlling heating medium
is an auxiliary temperature control for stabilizing the temperature of the
glass substrate 40. That is, in plasma etching, etc., not only a base material
but also the glass substrate 40 receives heat from plasma, and as a result, it
is sometimes difficult to maintain the glass substrate 40 at a predetermined

temperature by heating with the heater 15 alone. In this case, in addition to heating with the heater 15, the temperature-controlling heating medium having a lower temperature than a predetermined temperature is flowed in the piping 16 so as to offset heat from plasma, for maintaining the glass substrate 40 at the predetermined temperature. In this manner, the glass substrate 40 can be stabilized at the predetermined temperature. In FIG. 2, showing of particulars of etching apparatus such as an etching gas inlet port, a gate valve, etc., is omitted.

DEPR:
When a base material formed on the glass substrate 40 is plasma-etched by means of the etching apparatus 20 shown in FIG. 2, the glass substrate 40 shows almost no temperature increase caused by heat from plasma during etching treatment, and the glass substrate 40 can be stably maintained at a predetermined temperature. Since the temperature (for example, 250.degree. C.) of the glass substrate 40 can be stabilized highly accurately, an excellent anisotropic configuration can be formed in the base material. That is, since the glass substrate supporting stage 10 is allowed to exhibit electrostatic attracting force, the base material can be temperature-controlled with high accuracy which cannot be accomplished by any conventional technique.

DEPR:
The plasma etching apparatus may be, for example, an ICP type plasma etching apparatus as shown in FIG. 9. The etching apparatus 20C has a chamber 81 constituted of a chamber side wall 82 and a ceiling plate 83, and an induction coupled coil 84 disposed outside the chamber side wall 82. The chamber side

wall 82 is made of quartz, and the ceiling plate 83 is formed of a composite material as will be described later. The glass substrate supporting stage 10 (see FIG. 1A) is disposed inside the chamber 81 for supporting and holding a glass substrate 40. Further, a discharge outlet 88 for discharging gas in the chamber 81 is connected to negative pressure means (not shown) such as a vacuum pump. A bias power source 85 for controlling incident ion energy on a base material is connected to the glass substrate supporting stage 10. Further, a DC power source 86 is connected to the electrode 14 (see FIG. 1A) for allowing the ceramic layer 13 to exhibit an electrostatic attracting force. The heater 15 disposed within the matrix 12 of the glass substrate supporting stage 10 is connected to a power source 87. The etching apparatus 20C has a fluorescence fiber thermometer (not shown) for measuring a glass substrate 40 for temperatures. The temperature of the glass substrate supporting stage 10 can be controlled by detecting a temperature sensed with the fluorescence fiber thermometer with a control device (PID controller) (not shown) and controlling the power source 87 which is for supplying power to the heater 15.

DEPR:
When plasma etching treatment is carried out on a base material using a glass substrate processing apparatus which is an etching apparatus, there are some cases using an etching apparatus having a parallel-flat-plate upper opposing electrode disposed therein.

DEPR:
In the etching treatment, there can be prevented the occurrence of damage such as cracking of the ceramic layers 213 and 113 of the upper opposing electrode

90, the side wall 94 and the ceiling plate 95. In a conventional etching apparatus, for example, a fluorocarbon polymer precursor formed during discharging is deposited on an upper opposing electrode and a chamber side wall, which causes the fluctuation of carbon/fluorine ratio of plasma during etching. Since, however, the upper opposing electrode 90, the side wall 94 and the ceiling plate 95 can be heated to high temperatures and maintained at the high temperatures, the deposition of the precursor on the upper opposing electrode, the chamber side wall and the ceiling plate can be effectively prevented, which results in the prevention of the fluctuation of carbon/fluorine ratio of plasma during etching, and highly accurate stabilized dry etching treatment can be carried out. Further, since almost no fluorocarbon polymer is deposited on the upper opposing electrode, the chamber side wall and the ceiling plate, the particle level is not downgraded even if the etching procedures are repeated many times.

CCXR:
156/345

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DERWENT-WEEK: 199850

TITLE: Chemically enhanced sputter deposition process and apparatus - improves filling of metal films in high aspect ratio contact openings

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PATENT-FAMILY:

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APPLICATION-DATA:

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INT-CL_(IPC): C23C014/34

ABSTRACTED-PUB-NO: US 5827408A
BASIC-ABSTRACT: A method of filling openings in a substrate with many openings comprises passing a mixture of argon and up to 10 vol.% of halogen-containing gas into a physical vapour deposition chamber next to a target electrode (32) at a pressure below 0.1 torr and activating the target electrode and heating a substrate support electrode (34) to at least 150 deg. C to form volatile halides of target and sputter material onto the substrate. A portion of the target material in the openings is etched by the halides while continuing to deposit target material so that openings are filled from

the bottom. Also claimed are: (i) a physical deposition chamber for the above method having water-cooled target electrode (32), substrate support electrode (34), a shield (40) and two gas inlets (42,44), one for the mixture above and the other for a reducing gas. (ii) a process as above in which the substrate is heated to 500 deg. C.

USE - In depositing metal films into high aspect ratio contact openings on substrates.

ADVANTAGE - Contact openings are filled effectively and the process can be made to be self-cleaning.

CHOSEN-DRAWING: Dwg.3/4

TITLE-TERMS:
CHEMICAL ENHANCE SPUTTER DEPOSIT PROCESS APPARATUS IMPROVE FILL METAL FILM HIGH ASPECT RATIO CONTACT OPEN

DERWENT-CLASS: L03 M13 U11

CPI-CODES: L04-C13B; L04-D01; M13-F03;

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